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# Identification and Improvement of Accidents black Spots for Mixed Traffic Streets in Developed Cities-A Case Study

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***Abstract:Accidents are not natural but they are caused' is a common Cliche in the area of traffic Safety. Thus, if Accidents are caused by someone surely, ones responsible for could be identified and appropriate remedial measures developed and implemented to the extent feasible. The investigation is carried out to identify and analyze accident black spots in the study area. This study identifies the reasons for accidents that may be due to the improper geometric design, vehicle condition, and driver negligence or may be of environment factor and suggest measures on priority basis and alternatives to reduce the accidents in the streets of study area and identify black spots and conduct volume studies, spot speed & gap acceptance,through this research, an attempt has been made to develop Accident Prediction Model to take remedial measures in advance by studying future trends, to take mitigation measures to minimize the accident rates to certain extent and to take other safety measures. The model is developed using accident prediction model as a modelling technique and also to reduce the Fatality Rate in the study area.***

**Keywords:Black Spots, Spot Speed, Traffic Accidents, Volume Studies,Gap Acceptance**

## I. Introduction

The process of rapid and unplanned urbanization has resulted in an unprecedented revolution in the growth of motor vehicles world-wide. In India, more than 70,000 people get killed due to RTI(road traffic incidents) every year. Hyderabad Urban Development Area(HUDA) and has been growing at an average rate of 9% Population with an estimation to touch 13.64 million by 2021, and the increase in vehicular number has definitely created crisis in Hyderabad. If accident is caused by some, surely the ones responsible for could be identified and appropriate remedial measures developed and implemented to the extent feasible.

In most of the metropolitan cities in India, the road use patterns are very different from those in developed countries. Globalization had brought in significant changes in lifestyles and occupation. Migration from rural to urban in search of better livelihood, increasing population, urbanization and modern infrastructures have made man more and more dependent on motorized vehicles. This resulted in the increase in economic activities and there has tremendous growth of motor vehicles, Which is considered as one of the primary factors responsible for increasing road accidents in many metropolitan cities of developing countries.

### 1.1 Indian Accident Scenario

Indian traffic is of Heterogeneous with heavy presence of two wheelers. The mixed traffic conditions make the safety situation worse.The magnitude of road accidents at an alarming rate. Accident rate increased from the year 2001 number of accidents occurred 405637 to in year 2014 About 490,383 accidents occurred and 138,258 were killed. In India, 60% of total accidents take place during night through the night traffic is hardly 15% of 24hours Volume. Which means that the accident in India during night is eight times greater than the day traffic.

### 1.2 Study Area

A City with population of more than 12 million as per 2014, Hyderabad Metropolitan Development Authority (HMDA) is the major urban aggressively positioning itself as hub for Administrative, Financial, Industrial, Educational, Medical, Cultural activities resulting in high growth rate, The existing streets network in Hyderabad consists of arterial roads, sub arterial roads and local streets. HMDA spreads over an area of 650Sq.km,Telangana State Road Transport Authority (TSRTC). In the present study the data obtained from Hyderabad & Cyberabad Police within its jurisdiction have been used and identified blackspots.

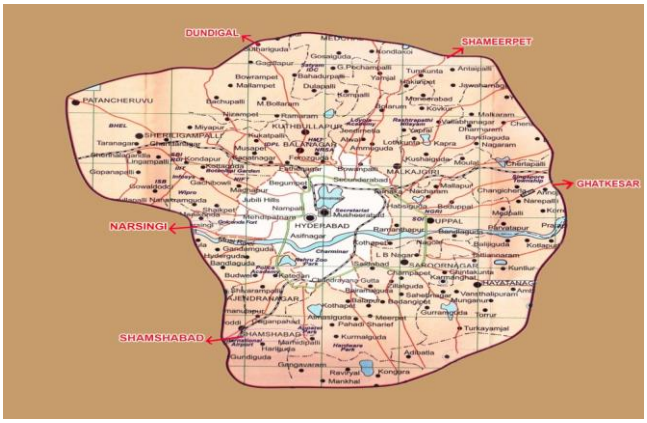


**Fig 1.1 Study Area**

### 1.3 Objective of the Study

1) To identify accident black spots in the study stretches.

ISSN:2319-6890)(online),2347-5013(print)
01 Oct. 2015

2) To understand the nature, type and mode of occurrence of accidents.

3) To analyze the causes of accidents on the study stretch and fatality rate.

4) Proving remedies for causes of accidents in study area.

## II. Methodology


Volume studies and spot speed, Gap Acceptance surveys has been conducted at Dundigal, Shamshabad, Shamirpet, Narsingi & Ghatkesar, to identify accident black spots in the study stretches and to understand the nature type and mode of occurrence of accidents analyze the causes of accidents on the study stretch model is used accident prediction model as a modelling technique.

## III. Results and Tables

The accident prediction model developed by Rokade.S given below:

$$\text{In (APW)}^{0.5} = 0.0212(AP) + 0.0007 (HTV^{0.75} + GAP^{1.25}) + 0.0210 (85^{th} PS)$$

Where,
APW = accident point weightage
AP = number of access points per kilometer
HTV = hourly traffic volume
Gap = amount of time, between the end of one vehicle and the beginning of the next in second.
85th PS = 85th percentile speed.

3.1 Range of Values Applicable to this model:

Table-1: Range of Values Applicable to this model

| Independent Variable | Range of Values |
|---|---|
| Number of access points per kilometre (AP) | 6-12 |
| Hourly Traffic Volume (HTV) | 1597-3952Vph |
| Gap (second) | 2.75-3.97 |
| 85th percentile speed (85th) | 63.30-82.20Kph |

In the Table-1 show number of access points per kilometre Range 6-12, hourly traffic volume range 1597-3952vph, gap acceptance range 2.75-3.97, 85th Percentile speed range 63.30-82.20kph is applicable for accident prediction model as a modelling technique.

Table-2: Access points at five places

| PLACE | AP (access points) | VALUE |
|---|---|---|
| DUNDIGAL | AP | 8 |
| SHAMSHABAD | AP | 6 |
| SHAMIRPET | AP | 9 |
| NARSINGI | AP | 7 |
| GHATKESAR | AP | 6 |

In the Table-2 show Access points at Dundigal-8, Shamshabad-6, Shamirpet-9, Narsingi-7, and Ghatkesar-6 are Observer at each study area.

Table-3: Hourly Traffic Volume for five places

| PLACE | HTV (hourly trafficvolume) | PCU |
|---|---|---|
| DUNDIGAL | HTV | 1049 |
| SHAMSHABAD | HTV | 1980 |
| SHAMIRPET | HTV | 3314 |
| NARSINGI | HTV | 1994 |
| GHATKESAR | HTV | 3090 |

In the Table-3 show Hourly Traffic Volume at Dundigal-1049, Shamshabad-1980, Shamirpet-3314, Narsingi-1994, & Ghatkesar-3090 are the values Obtained by volume studies

ISSN:2319-6890)(online),2347-5013(print)
01 Oct. 2015

Table-4: GAP Acceptance

| PLACE | GAP ACCEPTANCE | Sec |
|---|---|---|
| DUNDIGAL | GAP ACCEPTANCE | 2.20 |
| SHAMSHABAD | GAP ACCEPTANCE | 3.17 |
| SHAMIRPET | GAP ACCEPTANCE | 3.45 |
| NARSINGI | GAP ACCEPTANCE | 3.62 |
| GHATKESAR | GAP ACCEPTANCE | 2.51 |

In the Table-4 show gap acceptance at Dundigal-2.20, Shamshabad-3.17, Shamirpet-3.45, Narsingi-3.62 & Ghatkesar-2.51 are the values Obtained by Gap acceptance studies.

Table-5: 85$^{th}$ Percentile Speed

| PLACE | 85$^{th}$Percentile speed | Km/hr |
|---|---|---|
| DUNDIGAL | 85$^{th}$ | 64 |
| SHAMSHABAD | 85$^{th}$ | 66 |
| SHAMIRPET | 85$^{th}$ | 68 |
| NARSINGI | 85$^{th}$ | 65 |
| GHATKESAR | 85$^{th}$ | 70 |

In the Table-5 show 85$^{th}$ Percentile Speed at Dundigal-64, Shamshabad-66, Shamirpet-68, Narsingi-65 & Ghatkesar-70 are the values Obtained by Spot speed studies.

Table-6: Accident Point Weight age

| PLACE | Accident point weight age | VALUE |
|---|---|---|
| DUNDIGAL | In (APW)$^{0.5}$ | 164.45 |
| SHAMSHABAD | In (APW)$^{0.5}$ | 172.39 |
| SHAMIRPET | In (APW)$^{0.5}$ | 192.78 |
| NARSINGI | In (APW)$^{0.5}$ | 172.25 |
| GHATKESAR | In (APW)$^{0.5}$ | 188.95 |

In the Table-6 show Accident Point Weightage at Dundigal-164.45, Shamshabad-172.39, Shamirpet-192.78, and Narsingi-172.25 & Ghatkesar-188.95 is applicable foraccident prediction model as a modelling technique.

### 3.2 FATALITY RATE

Fatality rate determines the rate at which deaths occures due to accidents in a particular stretch of road in a year.

**FR = F X 100,000,000/ADT X 365**

**FR** = Fatality Rate
**F** = Fatal Accidents Per year per section
ADT = Average daily traffic (vehicles per day)

Table-7: Fatality rate for five places

| PLACE | FATAL ACCIDENTS | FATALITY RATE (%) |
|---|---|---|
| DUNDIGAL | 58 | 88.52 |
| SHAMSHABAD | 29 | 54.13 |
| SHAMIRPET | 71 | 14.26 |
| NARSINGI | 35 | 20.60 |
| GHATKESAR | 46 | 20.37 |

In the Table-7 show fatality rate at Dundigal-88.52, Shamshabad-54.13, Shamirpet-14.26, Narsingi-20.60 & Ghatkesar-20.37 are the values Obtained by Fatal rate.

3.2 Three years Accidents (2012-2014)

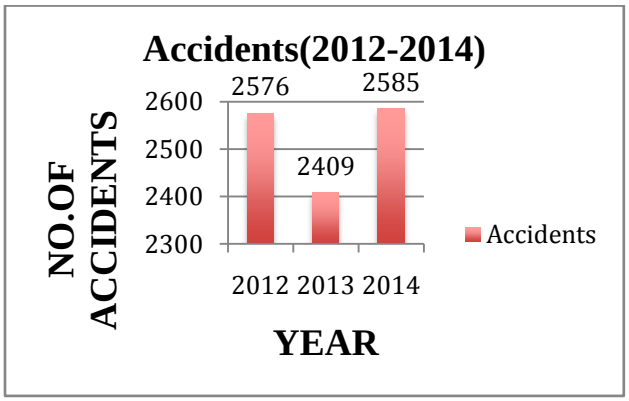


FIG-3.1 Last Three years Accidents

In the above graph show accident data at Hyderabad Year-2012 (2576), Year-2013 (2409), Year-2014 (2585).

### 3.3 Volume Studies Graphs

Volume Studies are conducted manually at intersections for which the vehicle volume count is to be conducted is first selected and tabular sheets which are to be used are slightly modified to the sheets used for straight roads and traffic enumerates are posted to each arm of intersection an enumerator has to note down the number of vehicles entering the intersection which can be broken down into three categories as left turning, right turning and straight going traffic. The volume counts may be conducted for the vehicles based on respective type as showing all the traffic passing through a stretch as only one type of traffic. Volume counts

ISSN:2319-6890)(online),2347-5013(print)
01 Oct. 2015

must be counted on 15 min intervals at 9:00am to 5:00pm at Dundigal, shamshabad, shamirpet, Narsingi and Ghatkesar.

3.3.1 DUNDIGAL TO GANDI MAISAMMA:

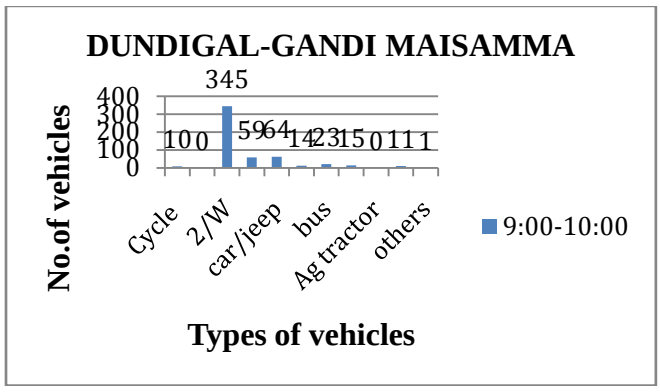


FIG-3.2 Peak hour Vehicles

Fig 3.2 shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 345.

3.3.2 GANDI MAISAMMA TO DUNDIGAL:

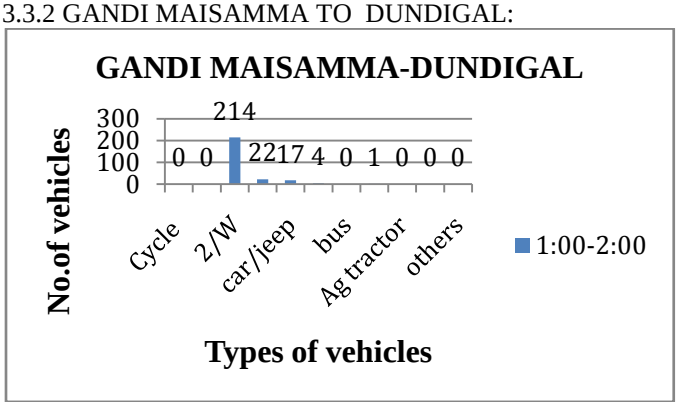


FIG-3.3 Peak hour Vehicles

Fig 3.3 shows 1:00-2:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 214.

3.3.3MEDAK-MEDCHAL:

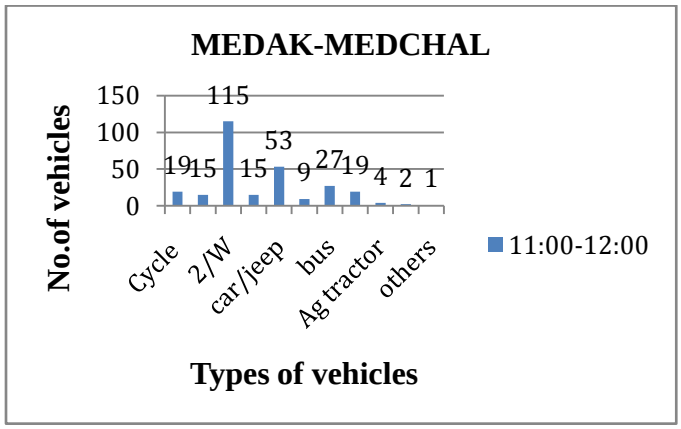


FIG-3.4 Peak hour Vehicles

Fig 3.4 shows 11:00-12:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 115.

3.3.4 MEDCHAL-MEDAK:

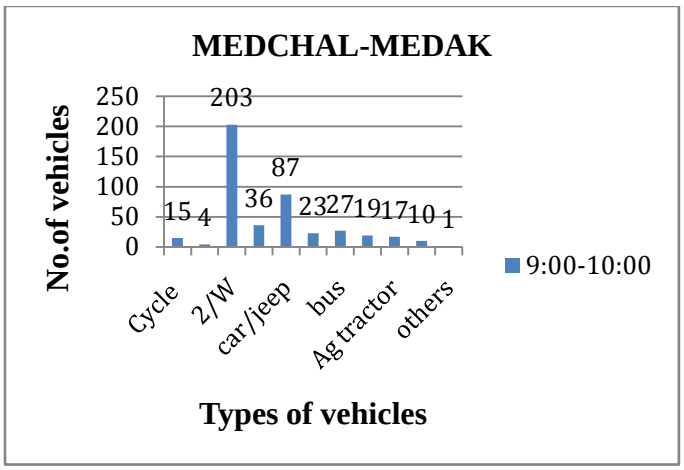


FIG-3.5 Peak hour Vehicles

Fig 3.5 shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 203.

3.3.5 Shamshabad-Malakram:

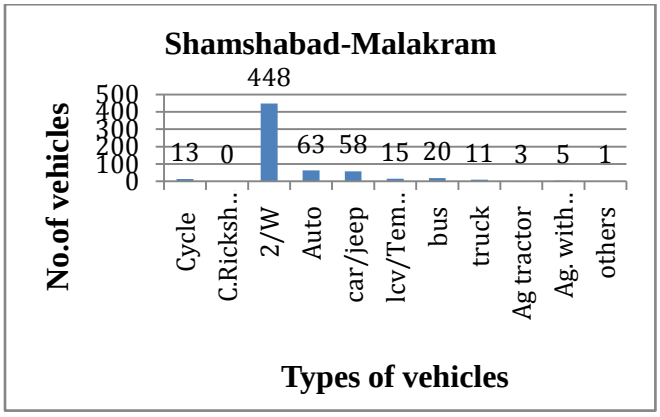


FIG-3.6 Peak hour Vehicles

Fig 3.6 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 448.

3.3.6 Malakram-Shamshabad:

ISSN:2319-6890)(online),2347-5013(print)
01 Oct. 2015

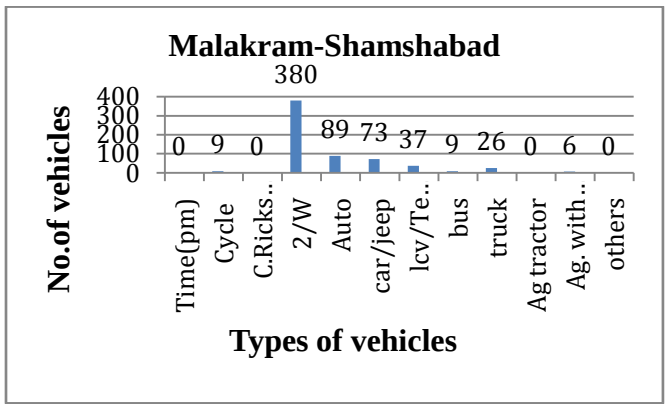


FIG-3.7 Peak hour Vehicles

Fig 3.7 Shows 11:00-12:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 380.

3.3.7 Tondupally-Gachibowli

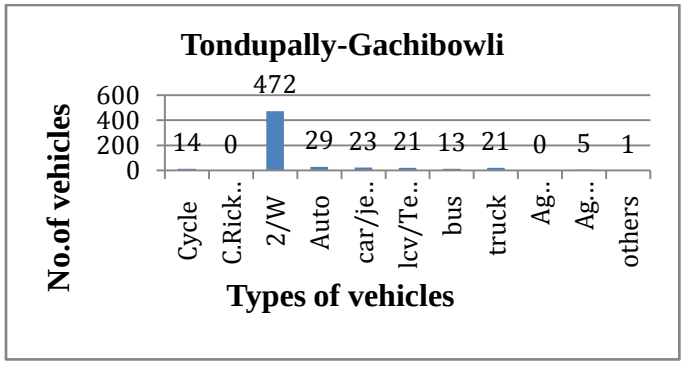


FIG-3.8 Peak hour Vehicles

Fig 3.8 Shows 4:00-5:00PM peak hour more Number of 2 wheelers is highest among all vehicles with 472.

3.3.8 Gachibowli-Tondupally:

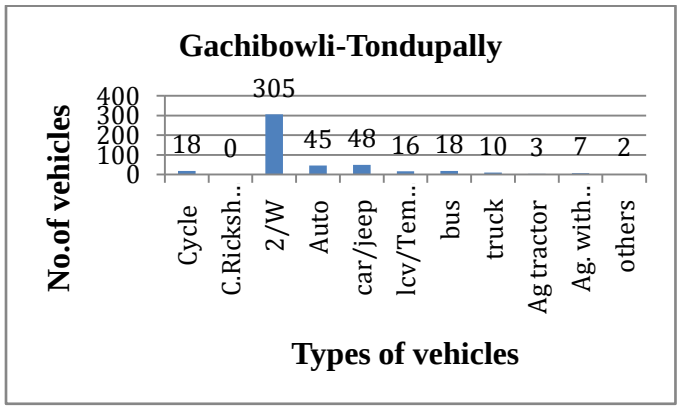


FIG-3.9 Peak hour Vehicles

Fig 3.9 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 305.

3.3.9 Shamirpet-Majeedpur:

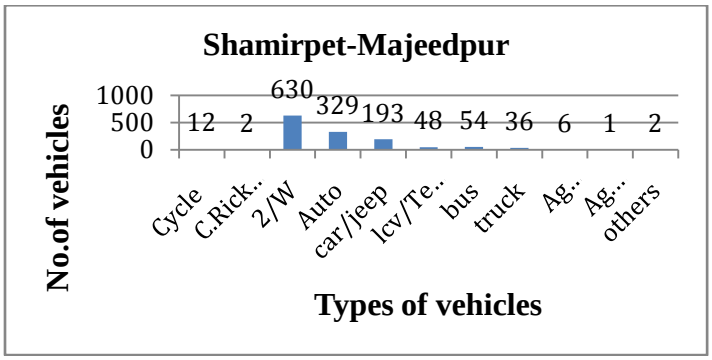


FIG-3.10 Peak hour Vehicles

Fig 3.10 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 630.

3.3.10 Majeedpur-Shamirpet:

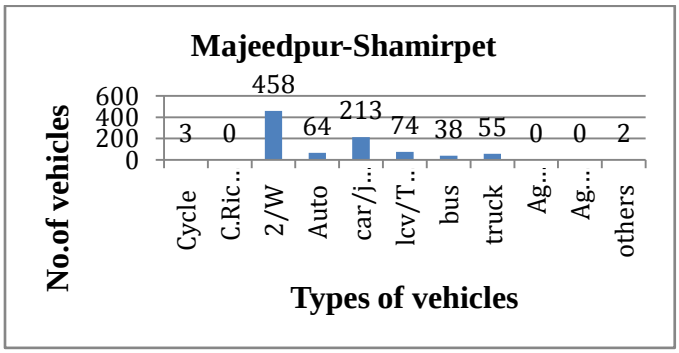


FIG-3.11 Peak hour Vehicles

Fig 3.11 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 458.

3.3.11 Secunderbad-Alliyabad:

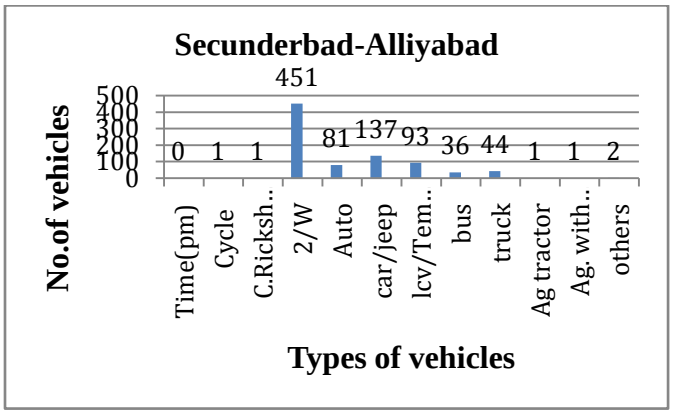


FIG-3.12 Peak hour Vehicles

Fig 3.12 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 451.

ISSN:2319-6890)(online),2347-5013(print)
01 Oct. 2015

3.3.12 Alliyabad-Secunderbad:

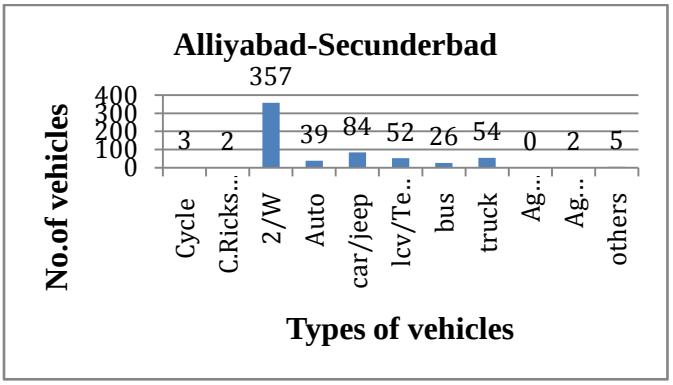


FIG-3.13 Peak hour Vehicles

Fig 3.13 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 357.

3.3.13 Narsingi-Manchirevula:

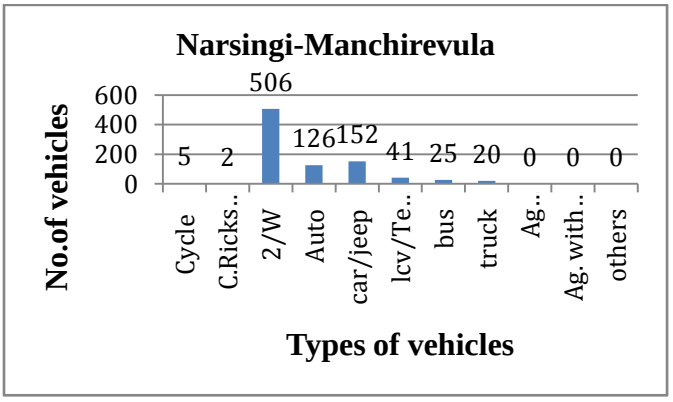


FIG-3.14 Peak hour Vehicles

Fig 3.14 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 506.

3.3.14 Manchirevula-Narsingi:

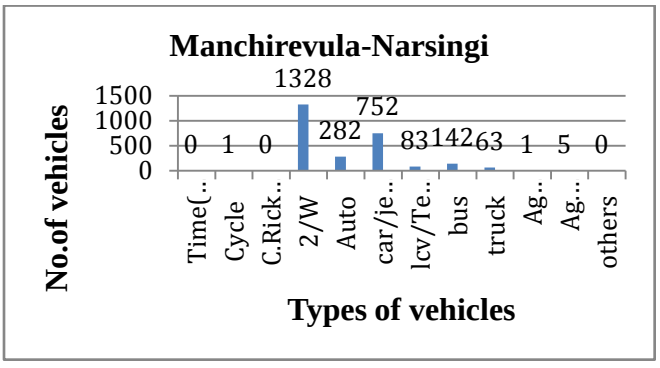


FIG-3.15 Peak hour Vehicles

Fig 3.15 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 1328.

3.3.15 Uppal-ECIL:

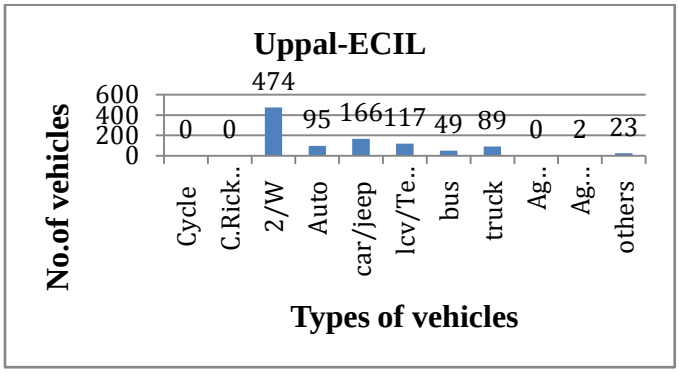


FIG-3.16 Peak hour Vehicles

Fig 3.16 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 474.

3.3.16 Uppal-Ghatkesar:

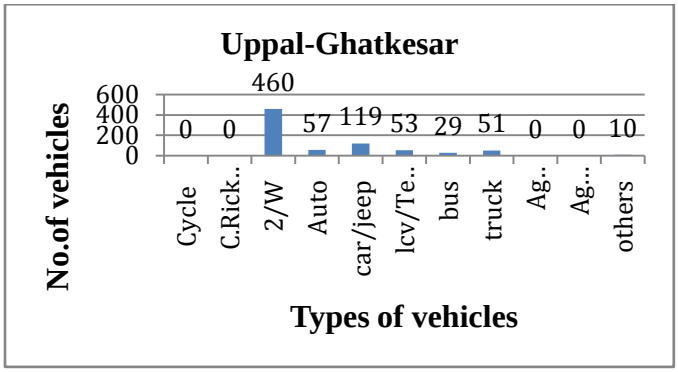


FIG-3.17 Peak hour Vehicles

Fig 3.17 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 460.

3.3.17 ECIL-Vijayawada:

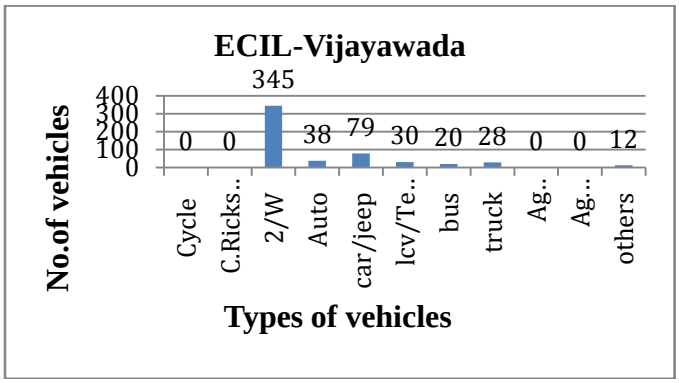


FIG-3.18 Peak hour Vehicles

Fig 3.18 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 345.

3.3.18 Ghatkesar-Secunderabad:

ISSN:2319-6890)(online),2347-5013(print)
01 Oct. 2015

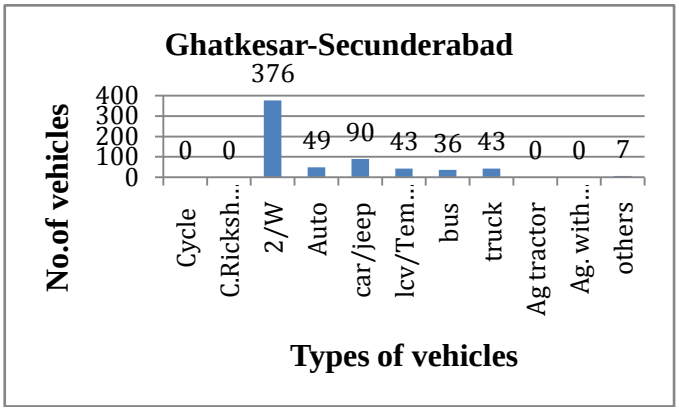


FIG-3.19 Peak hour Vehicles

Fig 3.19 Shows 9:00-10:00AM peak hour more Number of 2 wheelers is highest among all vehicles with 376.

## IV.Conclusions

- Accident point weightage of Dundigal-164.45, Shamshabad-172.39, Shamirpet-192.78, Narsingi-172.25, & Ghatkesar-188.95.
- Fatality Rate of Dundigal-88.52, Shamshabad-54.13, Shamirpet-14.26, Narsingi-20.60, & Ghatkesar-20.37.
- Blocking Ghatkesar-Uppal access point leads to reduce accident point weight age by 19.32%.
- The average speeds on the study area are of 85$^{th}$speed, Dundigal-64, Shamshabad-66, Shamirpet-68, Narsingi-65, & Ghatkesar-70.
- Reduction in capacity likely 100 vehicles per – hour will reduce accident weight age up to 14.33%.
- Channelization for every un-controlled intersection will improve gap acceptance also in reduction of accident point weight age up to 8.1%.
- Hourly traffic volume at Shamirpet among the study areas was 3314, which is at the edge of extreme limits falls between (1597-3952 vph) given by Rokade.S.
- It is observed as Shamirpet stretch will be an accident prone area with increase in vehicle hourly volume to 538, so traffic control and regulations required.

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Thank you Lord, for always being there for me.
This journal is only a beginning of my journey.

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